

Geology (GEOL)

GEOL 102 OUR DYNAMIC EARTH: INTRODUCTION TO GEOLOGY (3)

Lecture, 2 hours; laboratory, 3 hours. A study of the minerals, rocks, and landforms that make up our earth in the context of the dynamic forces that form them. Emphasis on local geology, including earthquakes and other environmental aspects. Laboratory study of minerals, rocks, and maps. Required one-day weekend field trip. Fee required. Satisfies GE Area B1 (Physical Sciences) and GE laboratory requirements.

GEOL 105 THE AGE OF DINOSAURS (3)

Lecture, 3 hours. The life and death of dinosaurs as evidenced by the fossil record will be studied to show how geology and biology combine in the discipline of paleontology. The evolution of dinosaurs over a 150-million- year time span sets the stage to investigate several interesting and ongoing controversies surrounding dinosaurs, including: why dinosaurs became extinct, the metabolism of dinosaurs, and the relationship between birds and dinosaurs. Satisfies GE Area B1 (Physical Sciences).

GEOL 107 INTRODUCTION TO EARTH SCIENCE (3)

This course studies the operation of the Earth system and its solar system home. It introduces the fundamental aspects of 4 major areas: astronomy; geology, including plate tectonics, and the planetary history of the Earth and its moon; physical oceanography; and weather and climate. There is no lab. The course is designed to prepare students for the earth science and astronomy parts of the SET examination. The prerequisite is that the student must be enrolled in the AMCS, LIBS, CALS, or ENSP credential program.

GEOL 110 NATURAL DISASTERS (3)

A course to examine the interaction between natural processes and human activities and the often costly and fatal results. Course emphasis will be on the principles underlying natural disasters such as earthquakes, volcanic eruptions, landslides, floods, severe weather, coastal processes, asteroid impacts, fires, great dyings, and population growth. Many examples will be drawn from the northern California area. Course content may vary with instructor. Satisfies GE Area B3 (Physical Sciences, Specific Emphasis).

GEOL 120 REGIONAL FIELD GEOLOGY (3)

Lecture, 1 hour. The heart of geology is in the field. The course is an examination of rocks, minerals, and landforms, and the processes that form them. This course includes a 10-day field trip taken during spring vacation, or multiple weekend field trips in the fall semester, where the natural world becomes our classroom. Prerequisite or co-requisite: any 100-level Geology course or instructor consent; students must be in good physical condition. Satisfies GE Area B3 (Specific Emphasis).

GEOL 205 MINERALOGY (4)

Lecture, 3 hours; laboratory, 3 hours. Principles of crystal chemistry, crystallography, and properties and origins of common rock-forming minerals. Laboratory sessions emphasize hand specimen and petrographic mineral identification characterization. Prerequisites: completion of or concurrent enrollment in GEOL 303 and CHEM 115A.

GEOL 205A MINERALOGY, OPTICS (2)

Supplementary course to be held concurrently with GEOL 205. For students who already have taken a mineralogy course but have not gained sufficient experience in optical mineralogy. Consists of the lecture and laboratory portion of GEOL 205 relevant to optical mineralogy. Prerequisite or co-requisites: GEOL 303 and CHEM 115A.

GEOL 301 NATURAL HISTORY OF THE HAWAIIAN ISLANDS (3)

Lecture, 3 hours. The origin and evolution of the flora and fauna of the most isolated archipelago in the world; geologic history and context of volcanic oceanic islands; conservation biology efforts to save the rare and endangered species of Hawaii. Satisfies GE Area B3 (Specific Emphasis in Natural Sciences). Prerequisite: BIOL 115 or 130A and 130B.

GEOL 302 GEOLOGY OF CLIMATE CHANGE (3)

Lecture, 3 hours. Climate changes on time scales of days to millions of years. We will review methods by which the amplitude and pacing of climate changes are measured, use data analysis to assess the significance of past climate variability, and consider interpretations and theories proposed to explain Earth's climate. Prerequisites: GEOL 102 and CHEM 115A.

GEOL 303 ADVANCED PRINCIPLES OF GEOLOGY (4)

Lecture, 3 hours; laboratory, 3 hours. Advanced treatment of the principles, methods, and tools within the geological sciences. We will discuss topics such as: plate tectonics, Earth materials and resources, Earth surface processes, geological hazards, how to read geological and topographic maps, how we decipher geological history, and much more. Prerequisite: one of the following: GEOL 102, 105, 107, 110, or 120; ANTH 201, ENSP 303, ENSP 309, BIOL 310, or GEOG 204. Satisfies GE Area B3 (Specific Emphasis).

GEOL 304 GEOLOGIC MAPPING AND REPORT WRITING (1)

Field studies and report preparation done in conjunction with GEOL 303. Required weekend field trips. Prerequisite: concurrent enrollment in GEOL 303. Students must be in good physical condition.

GEOL 306 ENVIRONMENTAL GEOLOGY (3)

Lecture, 3 hours. Study of geological principles and processes as they relate to our natural environment emphasizing interaction between human activities and the geological environment. Major topics include the nature and behavior of rocks and soils; earthquakes and their associated hazards; landslides, slope stability, and building construction; groundwater and pollution; stream processes and flooding; shoreline processes and coastal development; engineering geology and construction of highways and dams; and development of natural resources and conservation and ecology. Specific content varies year to year, depending on instructor. Prerequisite: GEOL 102 or consent of instructor.

GEOL 307 IGNEOUS AND METAMORPHIC PETROLOGY (4)

Lecture, 3 hours; laboratory, 3 hours. A study of the origin, properties, classification, and occurrence of igneous and metamorphic rocks. Laboratory exercises in the classification and description of minerals, textures, and structures of the more common rock types. Laboratory work will emphasize both hand specimen analysis and microscopic petrography. Prerequisites: GEOL 205, and GEOL 102 or GEOL 303.

GEOL 308 IGNEOUS AND METAMORPHIC PETROLOGY FIELD COURSE (1)

Field studies done in conjunction with GEOL 307. Required weekend field trips. Fee required. Prerequisite: concurrent enrollment in GEOL 307. Students must be in good physical condition.

GEOL 309 COMPUTER APPLICATIONS IN GEOLOGY (4)

Lecture; 3 hours; Laboratory, 3 hours. This course aims to provide our majors with some fundamental skills for manipulating and representing geological data using computer applications. Applications include using digitizing field maps and data into GIS format, creating figures in computer aided drawing programs, using basic functions computational software and generating histograms, and rose diagrams. Prerequisite or co-requisite: GEOL 303 and GEOL 304.

GEOL 310 GEOPHYSICS (4)

Lecture, 3 hours; laboratory, 3 hours. This course will cover the basic principles underlying various geophysical methods, field procedures, and data collection, and how to interpret geophysical data. Topics include seismic reflection and refraction, paleomagnetism, gravity and magnetic surveying, and how geophysical methods have augmented our overall understanding of the Earth's structure and Earth processes. Prerequisite: GEOL 303.

GEOL 311 SEDIMENTARY GEOLOGY (4)

Lecture, 3 hours; laboratory, 3 hours. The description, classification, and origin of sedimentary rocks. Discussion of weathering and origin of sediment, sediment transportation and sedimentary structures, clastic and nonclastic classification; and petrology. Prerequisites: GEOL 303 and 304.

GEOL 312 SEDIMENTARY GEOLOGY FIELD COURSE (1)

Lecture, 1 hour. Field studies done in conjunction with GEOL 311. Required weekend field trips. Prerequisites: GEOL 303 and concurrent enrollment in GEOL 311. Students must be in good physical condition.

GEOL 313 PALEONTOLOGY (4)

Lecture, 3 hours; laboratory, 3 hours. The study of fossils in their geological context. Topics include taxonomy, morphology, evolution, biogeography, extinction, and biostratigraphy of the main groups of invertebrate fossils. Laboratory work will include becoming familiar with stratigraphically important fossil groups and the use of fossils in solving both geological and biological problems. Prerequisites: GEOL 303 for majors, GEOL 102 for non-majors, or instructor consent.

GEOL 314 PALEONTOLOGY FIELD COURSE (1)

Lecture, 1 hour. Field studies done in conjunction with GEOL 313. Required weekend field trips. Prerequisites: GEOL 303 for majors, GEOL 102 for non-majors, and concurrent enrollment in GEOL 313. Students must be in good physical condition.

GEOL 317 STRUCTURAL GEOLOGY (4)

Lecture, 3 hours; laboratory, 3 hours. An introduction to deformation processes within the Earth's crust and the geological structures that result from these processes. We will examine deformation running the gamut of scales (from atomic scale to tectonic scale). Prerequisites: GEOL 303, GEOL 304 and MATH 160.

GEOL 318 STRUCTURAL GEOLOGY FIELD (1)

Lecture, 1 hour. Field studies done in conjunction with GEOL 317. Required weekend field trips. Prerequisite or co-requisite: GEOL 317. Students must be in good physical condition.

GEOL 320 BASIN ANALYSIS (4)

Lecture, 3 hours; laboratory, 3 hours. Origin and evolution of sedimentary basins; tectonic settings and significance; subsidence and thermal histories; basin-scale depositional systems; paleocurrent, provenance, and paleogeographic analysis; basin types; paleoclimatic influences; resources. Prerequisite: GEOL 311, 312, 317, and 318.

GEOL 321 BURGESS SHALE PALEONTOLOGY (3)

Lecture, 2 hours; laboratory, 3 hours. Advanced examination of the Cambrian Burgess Shale fossil deposits in British Columbia, Canada. Field work supplements lecture sessions on campus. Prerequisites: GEOL 313, GEOL 314, and consent of instructor. Students must be in good physical condition.

GEOL 323 HYDROLOGY (3)

Lecture, 3 hours. Water as a natural resource, the hydrologic cycle, distribution of water on the Earth. Atmospheric water, soil water, runoff, and groundwater as related to water supply and use. Applications to problems of flood control, water management, and water pollution, with special emphasis on California and Sonoma County. Prerequisites: GEOL 102 or consent of instructor; MATH 160.

GEOL 326 STRATIGRAPHY AND EARTH HISTORY (4)

Lecture, 3 hours; laboratory, 3 hours. The principles of stratigraphy and historical geology will be discussed, with special emphasis given to the application of these principles to the geologic development of North America. The geologic history of California will be treated in detail. The use of sedimentary rocks, fossils, and structural and tectonic principles will be discussed, especially as they relate to our understanding of historical geology. Laboratory work will include a study of sedimentary rocks and their properties, fossils and their occurrence and distribution, the construction and interpretation of various types of stratigraphic maps, and detailed studies of selected maps representative of the various geologic provinces of North America. Required field trip. Prerequisite: GEOL 303 or consent of instructor.

GEOL 395 COMMUNITY INVOLVEMENT PROGRAM (1-4)

CIP involves students in community problems such as tutoring, aiding in school science classes, and advisement of county agencies. A total of 6 units of CIP credit may be applied toward a degree. May be taken by petition only. Not applicable to the Geology major.

GEOL 396 INTERNSHIP IN GEOLOGY (1-4)

Professional geologic work for a geologic firm or agency. Forty-five hours of work per unit. Not applicable to the Geology major. Prerequisites: GEOL 303 and consent of instructor.

GEOL 406 X-RAY MINERALOGY (2)

Lecture, 1 hour; laboratory, 3 hours. Introduction to the use of x-ray diffraction techniques. Prerequisites: CHEM 115A and GEOL 205 or concurrent enrollment, and consent of instructor.

GEOL 420 INTEGRATIVE FIELD EXPERIENCE (4)

Lecture, 2 hours. This course is a synthesis of the Geology major core courses. This course aims to hone our students' abilities to make valid geologic field interpretations through detailed field mapping and report writing. Twelve days of fieldwork are required. Prerequisites: GEOL 308, GEOL 309, GEOL 312, and GEOL 318. Students must be in good physical condition.

GEOL 422 GEOCHEMISTRY (3)

Lecture, 3 hours. Introductory cosmochemistry and origin of the elements; meteorites; the Earth as a chemical system, chemistry of processes at the surface of the Earth; mineral crystal chemistry; introduction to geochronology and stable isotope variations in nature; thermodynamics and its geological application; geochemical prospecting. Prerequisites: GEOL 303, CHEM 115AB/116AB, MATH 161, or consent of instructor.

GEOL 425 ECONOMIC GEOLOGY (3)

Lecture, 3 hours. Classification, origin, and alteration of metallic ore deposits. Laboratory sessions on hand sample identification of ore and alteration minerals and petrographic analysis of selected ore suites. Prerequisites: previous or concurrent enrollment in GEOL 307 and CHEM 115B/116B.

GEOL 426A SENIOR THESIS I (3)

426A is the first semester of a senior thesis project. A senior thesis is an opportunity for students to engage in primary research. Students must write a proposal, defining the scope of their project. Thesis projects must be a two-semester project. Students will be required to present their projects at the Geology Colloquium. Prerequisite: thesis advisor consent.

GEOL 426B SENIOR THESIS II (3)

426B is the second semester of a senior thesis project. A senior thesis is an opportunity for students to engage in primary research. Students must write a proposal, defining the scope of their project. Thesis projects must be a two-semester project. Students will be required to present their projects at the Geology Colloquium. Prerequisites: thesis-advisor consent and GEOL 426A.

GEOL 427 ADVANCED FIELD GEOLOGY (4)

A minimum of five weeks of detailed mapping in igneous, metamorphic and sedimentary rocks, and the preparation of field reports and geological maps. Students may also complete this course at another university, but should do so only in consultation with the Geology Department. Students must demonstrate equivalence in terms of field hours and course content to GEOL 427. Prerequisite: senior-level standing in Geology. GEOL 420 strongly recommended.

GEOL 495 SPECIAL STUDIES (1-4)

Individual study, under guidance of an advisor, of an advanced field, laboratory, or literature problem. The student must have demonstrated ability to work independently and do quality work. The student must have a faculty sponsor who is willing to advise the project and will set up a schedule of meetings for this purpose. May be repeated for credit.

GEOL 496 SELECTED TOPICS IN GEOLOGY (1-3)

An intensive study of an advanced topic in geology. May be repeated for additional credit with new subject matter. Prerequisite: adequate preparation for topic under consideration. Additional fee may be required.

GEOL 498 GEOLOGY PRACTICUM (1-4)

Application of previously studied theory through supervised instructional work experience in geology, generally as a teaching assistant in geology laboratory classes. Intended for professional growth. May be repeated for up to a total of 4 units. Not applicable for the Geology major or minor. Prerequisites: upper-division standing in Geology and consent of instructor. Student needs to have passed the course that he/she will be a teaching assistant in with a grade of B or better. To be a teaching assistant in GEOL 102 laboratory student needs to have received a grade of B or better in GEOL 303.

Geography, Environmental Studies and Planning (GEP)**GEP 200 GLOBAL ENVIRONMENTAL ISSUES (3)**

Lecture/discussion, 3 hours. An introduction to environmental studies and planning, including: humans in relation to the global ecosystem; an overview of problems of energy use, pollution, resource depletion, population growth, food supply, urbanization, climate change, and biodiversity; and the search for solutions and future prospects. Satisfies GE Area D5 (Contemporary International Perspectives).

GEP 201 GLOBAL ENVIRONMENTAL SYSTEMS (4)

This course presents a broad survey of how the earth works. It focuses on the processes within, and the relationships between, the four global sub-systems: the atmosphere, biosphere, hydrosphere, and lithosphere. The course examines how physical, chemical, and biological functions create local, regional, and global climate and landscape patterns. It also explores the links between human activities and changes in climate, vegetation patterns, and landform processes. The course includes weekly two-hour lab sessions in which students participate in field-based data collection exercises and conduct scientific analyses. Satisfies GE Area B1 (Physical Science).

GEP 202 QUANTITATIVE METHODS (3)

Lectures and workshop designed to enhance students' confidence in analytical problem solving. Essential techniques emphasizing environmental applications: translating knowledge into abstract and mathematical models, numerical estimates, basic geometry and trigonometry, dimensional analysis, unit conversions, interpreting statistical data, and graphic display of information. Conceptual introduction to calculus, differential equations, and complex numbers. Prerequisites: Completion or concurrent enrollment in GE Area B4 (Math Concepts).

GEP 203 HUMAN GEOGRAPHY (3)

The course introduces students to a spatial perspective of cultural, economic, political, demographic, and environmental processes. We review the deep historical origins of many social processes and examine how they continue to influence our contemporary experience. We also study how these processes change as they move across geographic space and encounter other cultures and places. Satisfies GE Area D2 (World History and Civilization).

GEP 205 WORLD REGIONAL GEOGRAPHY (3)

This course explores 4-5 world regions from a holistic perspective, examining their economic, political, demographic, cultural, and environmental landscapes with considerable historic depth. The course also considers how each region fits within a larger global political and economic system, and how their roles have changed, particularly with globalization. Satisfies GE Area D5 (Contemporary International Perspectives).

GEP 206 SOCIETY, ENVIRONMENT, AND SUSTAINABLE DEVELOPMENT (3)

The course brings an historical perspective to critical analyses of changing relationships between civilizations and their environments. Following an introduction to Earth's environmental systems, course critiques several modes of understanding specific environmental problems caused by development. Course concludes with extended study of one globally important human-environment-development nexus. Meets GE Area D2 (World History & Civilization).

GEP 305 WORLD REGIONS IN GLOBAL CONTEXT (4)

Selected regions of the world form the basis of study. Economic development, political problems, man-land relationships, and global issues are covered. The course uses geographical methodologies and concepts and is interdisciplinary in its observations of world regions. Satisfies GE Area D5 (Contemporary International Perspectives).

GEP 310 PROFESSIONAL PREPARATION (1-2)

This seminar covers topics essential for professional preparation in the fields of geography and environmental studies. Topics include discussions with guest speakers on career options in governmental, private, and non-profit settings; writing highly effective resumes, CVs, and cover letters; and techniques for successful interviewing. The course will also cover preparation for future training in professional and academic fields. Cr/NC only. Prerequisites: GEP majors, juniors or seniors.